

NT4H GUI example user manual

v1.0

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1.Introduction

The NT4H is a new series of NX NTAG® cards.

There is NTAG413 DNA, NTAG424 DNA, and NTAG424 TT DNA.

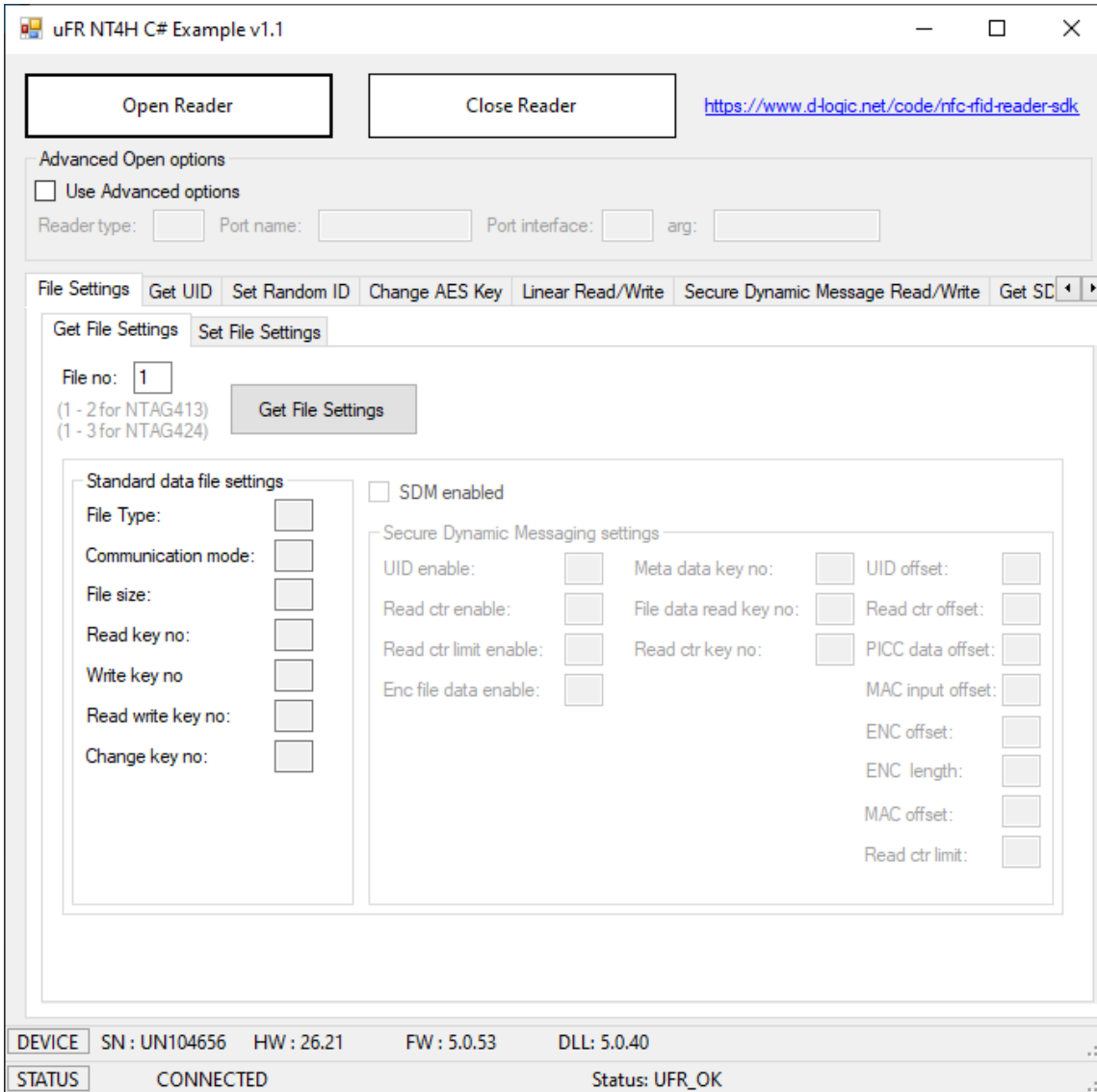
NTAG424 DNA is fully compliant with the NFC Forum Type 4 Tag IC.

They come with AES-128 cryptographic operation and a new Secure Unique NFC (SUN) Message.

2.Application overview

Link: https://www.d-logic.net/code/nfc-rfid-reader-sdk/ufr-examples-c_sharp-nt4h

In the following picture, is the layout for the application where simple reader opening mode was used..



2.1 Get File Settings

The NTAG413 has two standard data files:

- File number 1 is Capability Container file (32 bytes)
- File number 2 is NDEF file (128 bytes)

The NTAG424 has three standard data files:

- File number 1 is Capability Container file (32 bytes)
- File number 2 is NDEF file (256 bytes)
- File number 3 is proprietary file (128 bytes)

Number of returned parameters varies.

If the current file is standard data file with AES secure messaging, then the following information is obtained:

- File type
- Communication mode
- File access rights
- File size

Example:

File number = 3 (NTAG424 proprietary file)

Communication mode is enciphered (0x03)

Secure dynamic messaging is disabled

Key number for read is 2

Key number for write is 3

Key number for read/write is 3

Key number for change file settings is 0

File size is 128 bytes

uFR NT4H C# Example v1.1

Open Reader Close Reader <https://www.d-logic.net/code/nfc-rfid-reader-sdk>

Advanced Open options

☐ Use Advanced options

Reader type: Port name: Port interface: arg:

File Settings Get UID Set Random ID Change AES Key Linear Read/Write Secure Dynamic Message Read/Write Get SD

Get File Settings Set File Settings

File no: 3
(1 - 2 for NTAG413)
(1 - 3 for NTAG424)

Get File Settings

Standard data file settings

File Type: 0

Communication mode: 3

File size: 128

Read key no: 2

Write key no: 3

Read write key no: 3

Change key no: 0

☐ SDM enabled

Secure Dynamic Messaging settings

UID enable: Meta data key no: UID offset:

Read ctr enable: File data read key no: Read ctr offset:

Read ctr limit enable: Read ctr key no: PICC data offset:

Enc file data enable: MAC input offset:

ENC offset:

ENC length:

MAC offset:

Read ctr limit:

DEVICE SN : UN104656 HW : 26.21 FW : 5.0.53 DLL : 5.0.40

STATUS CONNECTED Get file settings successful: UFR_OK

If the current file is a standard data file **with secure dynamic messaging** then there is more information.

Example:

File number is 2 (NDEF file)

Secure dynamic messaging is enabled

Free access for reading and writing operations (key 0x0E)

UID mirroring is enabled

SDM reading counter is enabled

SDM reading counter limit is disabled.

Encrypted part of file data used.

Key number for SDM meta read is 2 (UID, SDM reading counter, PICC data, MAC)

Key number for encrypted part of file data is 2

SDM reading counter can read without authentication

PICC data offset (encrypted UID and SDM reading counter) is 49

MAC input offset is 86

Encrypted part of the file data offset is 86

Encrypted part of the file data length is 32

MAC offset is 124

The screenshot shows the 'uFR NT4H C# Example v1.1' application window. At the top, there are 'Open Reader' and 'Close Reader' buttons, and a link to 'https://www.d-logic.net/code/nfc-rfid-reader-sdk'. Below these is a section for 'Advanced Open options' with a checkbox for 'Use Advanced options' and input fields for 'Reader type', 'Port name', 'Port interface', and 'arg'. A tabbed interface follows, with 'File Settings' selected. Under 'File Settings', there are sub-tabs for 'Get File Settings' and 'Set File Settings'. The 'Get File Settings' sub-tab is active, showing 'File no: 2' (with a note: '(1 - 2 for NTAG413) (1 - 3 for NTAG424)') and a 'Get File Settings' button. Below this, there are two main sections: 'Standard data file settings' and 'Secure Dynamic Messaging settings'. The 'Standard data file settings' section includes input fields for 'File Type' (0), 'Communication mode' (0), 'File size' (256), 'Read key no' (14), 'Write key no' (14), 'Read write key no' (14), and 'Change key no' (0). The 'Secure Dynamic Messaging settings' section has a checked 'SDM enabled' checkbox and various settings: 'UID enable' (1), 'Meta data key no' (2), 'UID offset' (0), 'Read ctr enable' (1), 'File data read key no' (2), 'Read ctr offset' (0), 'Read ctr limit enable' (0), 'Read ctr key no' (14), 'PICC data offset' (49), 'ENC file data enable' (1), 'MAC input offset' (86), 'ENC offset' (86), 'ENC length' (32), 'MAC offset' (124), and 'Read ctr limit' (0). At the bottom, a status bar shows 'DEVICE' information (SN: UN104656, HW: 26.21, FW: 5.0.53, DLL: 5.0.40) and 'STATUS' as 'CONNECTED'. A message at the bottom right says 'Get file settings successful: UFR_OK'.

2.2 Set file settings

Due to the large number of parameters, there are two functions for setting file parameters.

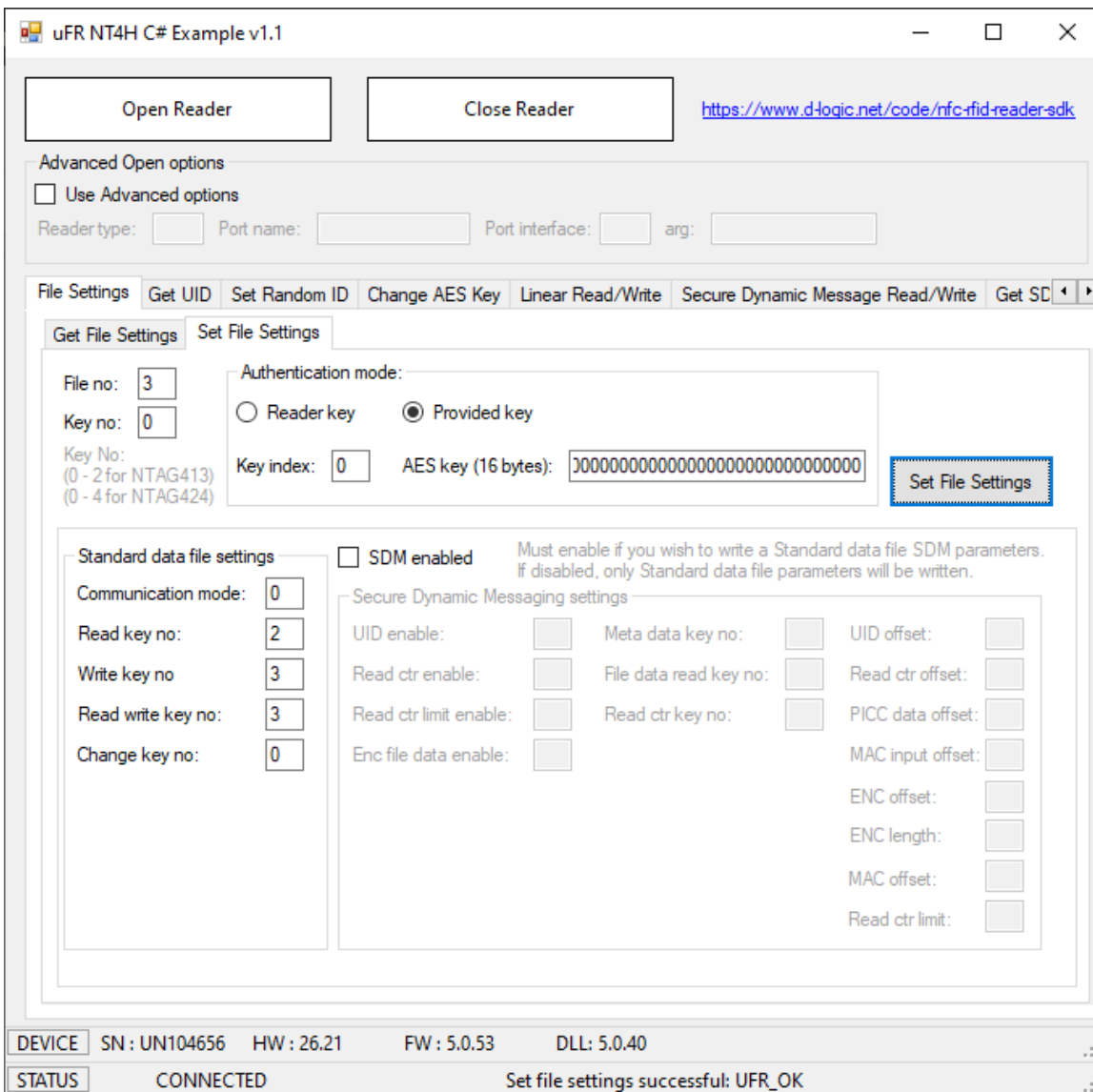
Example 1:

Standard data file

File number (Proprietary file)

Current communication mode is enciphered and the change key number is 0.

New settings are: plain communication mode, read key 2, write key 3, read/write key 3, change key 0, and authentication mode provided key.



The screenshot shows the 'uFR NT4H C# Example v1.1' application window. At the top, there are 'Open Reader' and 'Close Reader' buttons, and a URL: <https://www.d-logic.net/code/rfid-reader-sdk>. Below these are 'Advanced Open options' with a checkbox for 'Use Advanced options' and input fields for 'Reader type', 'Port name', 'Port interface', and 'arg'. A tabbed interface at the bottom shows 'File Settings' as the active tab. Within 'File Settings', there are sub-tabs for 'Get File Settings' and 'Set File Settings'. The 'Set File Settings' sub-tab is active, showing fields for 'File no:' (3), 'Key no:' (0), 'Authentication mode:' (Radio buttons for 'Reader key' and 'Provided key', with 'Provided key' selected), 'Key index:' (0), and 'AES key (16 bytes):' (a long string of zeros). A 'Set File Settings' button is to the right. Below this, there are 'Standard data file settings' and 'Secure Dynamic Messaging settings'. The 'Standard data file settings' section includes 'Communication mode:' (0), 'Read key no:' (2), 'Write key no:' (3), 'Read write key no:' (3), and 'Change key no:' (0). The 'Secure Dynamic Messaging settings' section includes a checkbox for 'SDM enabled' (unchecked) and various enable/disable checkboxes for UID, Read ctr, Read ctr limit, Enc file data, Meta data key no, File data read key no, Read ctr key no, and their respective offsets and limits. At the bottom of the window, a status bar shows 'DEVICE' information (SN: UN104656, HW: 26.21, FW: 5.0.53, DLL: 5.0.40) and 'STATUS' (CONNECTED, Set file settings successful: UFR_OK).

Example 2:

Standard data file with secure dynamic messaging. NTAG424 TT.

File number 2.

Communication mode plain, SDM enabled, Read key 14 (free access), Write key 14, Read/Write key 14, and the Change key 0.

SDM options:

UID mirroring: enabled

Read counter: enabled

Read counter limit: disabled

Encrypted part of file data: disabled

SDM access rights (0x0E free/plain, 0x0F no access/no data):

SDM meta read: 0x0E

SDM file key: 0x00

SDM reading counter read key: 0x0E

UID offset: 26

Read counter offset: 41

Mac input data offset: 57

MAC offset: 57

uFR NT4H C# Example v1.1

Open Reader

Close Reader

<https://www.d-logic.net/code/nfc-rfid-reader-sdk>

Advanced Open options

☐ Use Advanced options

Reader type: Port name: Port interface: arg:

File Settings

Get UID

Set Random ID

Change AES Key

Linear Read/Write

Secure Dynamic Message Read/Write

Get SD

Get File Settings

Set File Settings

File no:
 Key no:
 Key No:
(0 - 2 for NTAG413)
(0 - 4 for NTAG424)

Authentication mode:
☐ Reader key ☒ Provided key

Key index: AES key (16 bytes):

Set File Settings

Standard data file settings

☒ SDM enabled

Must enable if you wish to write a Standard data file SDM parameters. If disabled, only Standard data file parameters will be written.

Secure Dynamic Messaging settings

UID enable:
 Meta data key no:
 UID offset:

Read ctr enable:
 File data read key no:
 Read ctr offset:

Read write key no:
 Read ctr key no:
 PICC data offset:

Change key no:
 Enc file data enable:
 MAC input offset:

ENC offset:
 ENC length:
 MAC offset:

Read ctr limit:

DEVICE

SN : UN104656

HW : 26.21

FW : 5.0.53

DLL: 5.0.40

STATUS

CONNECTED

Set file settings successful: UFR_OK

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2.3 Get UID

NTAG424 DNA only.

Function returns 7 bytes long card UID. This is useful if the Random ID option is activated.

Valid authentication with any card key is required.

The screenshot shows a software application window titled "uFR NT4H C# Example v1.1". It features a top bar with "Open Reader" and "Close Reader" buttons, and a URL: <https://www.d-logic.net/code/nfc-rfid-reader-sdk>. Below this is a section for "Advanced Open options" with a checkbox for "Use Advanced options" and input fields for "Reader type:", "Port name:", "Port interface:", and "arg:". A tabbed interface follows, with "Get UID" selected. The "Get UID" tab contains a "Key no:" field with value "0", an "Authentication mode:" section with "Reader key" selected, a "Key index:" field with value "0", and an "AES key (16 bytes):" field with a long string of zeros. A "Get UID" button is present. Below the button, the "UID:" field displays "04:72:7B:92:76:63:80". At the bottom, a status bar shows device information (SN: UN104656, HW: 26.21, FW: 5.0.53, DLL: 5.0.40) and a status of "CONNECTED" with the message "Get UID successful: UFR_OK".

uFR NT4H C# Example v1.1

Open Reader Close Reader <https://www.d-logic.net/code/nfc-rfid-reader-sdk>

Advanced Open options

☐ Use Advanced options

Reader type: Port name: Port interface: arg:

File Settings **Get UID** Set Random ID Change AES Key Linear Read/Write Secure Dynamic Message Read/Write Get SC

Key no: 0

Authentication mode:

☒ Reader key ☐ Provided key

Key index: 0 AES key (16 bytes): 00000000000000000000000000000000

Get UID

UID: 04:72:7B:92:76:63:80

DEVICE SN : UN104656 HW : 26.21 FW : 5.0.53 DLL : 5.0.40

STATUS CONNECTED Get UID successful: UFR_OK

2.4 Set Random ID

NTAG424 DNA only.

The card returns 4 bytes random ID instead of 7 bytes unique ID.

Warning: this operation is irreversible.

Authentication with application master key (number 0) is required.

The screenshot shows the 'uFR NT4H C# Example v1.1' application window. At the top, there are 'Open Reader' and 'Close Reader' buttons, and a URL: <https://www.d-logic.net/code/nfc-rfid-reader-sdk>. Below these is a section for 'Advanced Open options' with a checkbox 'Use Advanced options' and input fields for 'Reader type', 'Port name', 'Port interface', and 'arg'. A tabbed interface follows, with 'Set Random ID' selected. The 'Authentication mode' section has radio buttons for 'Reader key' (selected) and 'Provided key'. Below this are input fields for 'Key index' (0) and 'AES key (16 bytes)' (00000000000000000000000000000000). A 'Set Random ID' button is highlighted with a blue border. At the bottom, a status bar shows device information: SN: UN104656, HW: 26.21, FW: 5.0.53, DLL: 5.0.40, and a status of 'CONNECTED' with the message 'Set random ID successful: UFR_OK'.

2.5 Change AES key

Authentication with application master key (number 0) is required.

If the key which will be changed is not the master key, then the old key value is required.

Example:

Key number 4.

Application master key value: 0x

Old key 4 value: 0x00000000000000000000000000000000

New key 4 value: 0x11111111111111111111111111111111

The screenshot shows a software application window titled "uFR NT4H C# Example v1.1". The interface includes several buttons and input fields. At the top, there are "Open Reader" and "Close Reader" buttons, and a URL: <https://www.d-logic.net/code/nfc-rfid-reader-sdk>. Below these is a section for "Advanced Open options" with a checkbox for "Use Advanced options" and input fields for "Reader type:", "Port name:", "Port interface:", and "arg:". A tabbed menu at the bottom of the main area includes "File Settings", "Get UID", "Set Random ID", "Change AES Key" (which is the active tab), "Linear Read/Write", "Secure Dynamic Message Read/Write", and "Get SD". The "Change AES Key" tab contains a "Key no:" field with the value "4", an "Authentication mode:" section with radio buttons for "Reader key" and "Provided key" (the latter is selected), a "Key index:" field with the value "0", and an "AES key (16 bytes):" field with a long string of zeros. Below these are "New key:" and "Old key:" fields, both containing hexadecimal strings. A "Change AES Key" button is at the bottom of this section. The status bar at the very bottom displays device information: "DEVICE SN : UN104656 HW : 26.21 FW : 5.0.53 DLL : 5.0.40" and "STATUS CONNECTED Change AES key successful: UFR_OK".

2.6 Linear read

Function reads data from the file.

Required parameters are

- File number
- Key number for read, or read/write access
- Communication mode
- Authentication mode (if read key is 14 then no authentication required)
- Start address (0 - max address)
- Length of data

[illegible]

2.7 Linear write

Function writes data to the file.

Required parameters are

- File number
- Key number for read, or read/write access
- Communication mode

- Authentication mode (if read key is 14 then no authentication required)
- Start address (0 - max address)
- Length of data

uFR NT4H C# Example v1.1

Open Reader Close Reader <https://www.d-logic.net/code/nfc-rfid-reader-sdk>

Advanced Open options

☐ Use Advanced options

Reader type: Port name: Port interface: arg:

File Settings Get UID Set Random ID Change AES Key Linear Read/Write Secure Dynamic Message Read/Write Get SD

Linear Read Linear Write

File no:

Key no:

Communication mode:

Authentication mode:

☐ Reader key ☒ Provided key ☐ No authentication

Key index: AES key (16 bytes):

Linear address:

Length:

Write Data

Input

☒ ASCII ☐ Hex

Data to write: Bytes written:

DLogic Linear Write test

DEVICE SN : UN104656 HW : 26.21 FW : 5.0.54 DLL : 5.0.54

STATUS CONNECTED Linear write successful: UFR_OK

2.8 Secure Dynamic Message Read

File must be in Secure dynamic message mode (SDM enabled), and read access must be free (key no 14, no authentication required)

Example for NTAG424

uFR NT4H C# Example v1.1

Open Reader Close Reader <https://www.d-logic.net/code/nfc-rfid-reader-sdk>

Advanced Open options

☐ Use Advanced options

Reader type: Port name: Port interface: arg:

File Settings Get UID Set Random ID Change AES Key Linear Read/Write Secure Dynamic Message Read/Write Get SD

Read Write

File no: Key no:

Authentication mode:

☒ Reader key ☐ Provided key

Key index: AES key (16 bytes):

Meta data AES key(16 bytes):

File data read AES key (16 bytes):

Raw Hex data:

NDEF file context:

PICC encrypted data:

UID: Reading counter:

ASCII UID: SDM reading counter:

Encrypted part of file data:

Part of file data:

ASCII MAC data:

ASCII MAC Input data:

SDM Read

DEVICE SN : UN104656 HW : 26.21 FW : 5.0.54 DLL : 5.0.54

STATUS CONNECTED MAC is correct

2.9 Secure Dynamic Message Write

File must be in Secure dynamic message mode (SDM enabled), and read access must be free (key no 14, no authentication required)

uFR NT4H C# Example v1.1

Open Reader Close Reader <https://www.d-logic.net/code/nfc-rfid-reader-sdk>

Advanced Open options
☐ Use Advanced options
 Reader type: Port name: Port interface: arg:

File Settings Get UID Set Random ID Change AES Key Linear Read/Write Secure Dynamic Message Read/Write Get SD

Read Write

File no:
 Key no:

Authentication mode:
☒ Reader key ☐ Provided key
 Key index: AES key (16 bytes):

Write key no: ☒ Encrypted part of file data enable
 Read write key no: ☒ Does MAC exist?
 New change key no: SDM file data read access:
☒ SDM reading counter limit enable
 SDM reading counter limit:

SDM reading counter access:
 URL:
☐ Enter additional number of characters for MAC calcul
 No of characters:
 ASCII Data for encryption: (NTAG424 Only)

☒ Does PICC data (UID, SDM reading counter) exist?
 NTAG424 Only
☒ Is PICC data encrypted?
 SDM meta read access:
☒ UID mirroring enable?
☒ Reading counter mirroring enable

SDM Write

DEVICE SN : UN104656 HW : 26.21 FW : 5.0.54 DLL: 5.0.54
 STATUS CONNECTED Secure dynamic message write successful

2.10 Get SDM Reading Counter

The Secure dynamic message reading counter exists only if SDM is enabled in file settings. It depends on the setting of SDM reading counter acces, authentication required or not.

uFR NT4H C# Example v1.1

Open Reader

Close Reader

<https://www.d-logic.net/code/nfc-rfid-reader-sdk>

Advanced Open options

☐ Use Advanced options

Reader type:

Port name:

Port interface:

arg:

Linear Read/Write

Secure Dynamic Message Read/Write

Get SDM Reading Counter

Store AES Key Into Reader

File no:

2

Key no:

0

Authentication mode:

☒ Reader key
 ☐ Provided key
 ☐ No authentication

Key index:

0

AES key (16 bytes):

00000000000000000000000000000000

Get SDM Reading Counter

SDM Reading Counter:

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DEVICE

SN : UN104656

HW : 26.21

FW : 5.0.54

DLL: 5.0.54

STATUS

CONNECTED

Linear write successful: UFR_OK

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2019-10-31	1.0	Base document